

## PATENT ABSTRACTS OF JAPAN

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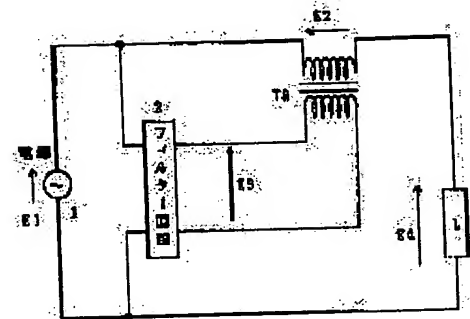
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## (54) LINE FILTER

## (57)Abstract:

**PROBLEM TO BE SOLVED:** To provide a compact and lightweight line filter which can eliminate electromagnetic wave noises and also can shape the waveform by connecting a series transformer between an AC power supply and a load to make the phase reverse to the power voltage.

**SOLUTION:** The secondary winding of a series transformer TR is connected in series between an AC power supply 1 and a load L as a means that shapes the waveform of the power voltage E1, so that the phase difference is set to 180° against the voltage E1. In such a constitution, the power source higher harmonics and the electromagnetic noise component passing through a filter circuit 2 of the voltage E1 are subtracted from the power supply via the TR. The noise component E2 is removed out of the voltage E1 and the load voltage E4 is obtained. Therefore, only the sine wave voltage is applied to the load L. As a result, the power source higher harmonics and the electromagnetic noises entering from a power line and a signal line can be eliminated and also the waveform of the inverter output, etc., can be shaped in a comparatively simple way.



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CLAIMS

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[Claim(s)]

[Claim 1] The line filter characterized by connecting the secondary coil of a series transformer to a serial as a means to operate a power-source wave orthopedically, connecting the input side of a filter circuit to said AC power supply, connecting the output side of said filter circuit to the primary coil of said series transformer, and changing between AC power supply and a load

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Industrial Application] the electromagnetism which invades from the power-source higher harmonic and power-source Rhine where this invention poses a problem according to increase of a digital device these days, a signal line, etc. -- it is related with the line filter for waveform shaping of the line filter for removing a noise, or an inverter output.

[0002]

[Description of the Prior Art] That with which the conventional line filter mainly combined a reactor, a capacitor, and resistance is almost the case.

[0003]

[Problem(s) to be Solved by the Invention] however, so that it becomes large power in the conventional line filter -- a power-source higher harmonic wave and electromagnetism -- waveform shaping of removal of a noise, an inverter output, etc. is very difficult. then, the electromagnetism which the purpose of this invention solves the above problems and invades from a power-source higher harmonic wave, power-source Rhine, a signal line, etc. -- while shaping removal, an inverter output, etc. of a noise in waveform by the comparatively easy method, the dimension of the conventional line filter, weight, conversion efficiency, dependability, a manufacturing cost, etc. are improved, and it aims at bringing about economical effectiveness in many fields.

[0004]

[Means for Solving the Problem] Between AC power supply and a load, the line filter of this invention connects the secondary coil of a series transformer to a power source and reversed polarity as a means to operate a power-source wave orthopedically at a serial, connects the input side of a filter circuit to said AC power supply, connects the output side of said filter circuit to the primary coil of said series transformer, and changes.

[0005]

[Function] the power-source higher harmonic which therefore passed through the filter circuit of supply voltage for the line filter of this invention which consists of the above-mentioned configuration to put in a series transformer between AC power supply and a load so that it may become supply voltage and an opposite phase, and electromagnetism -- since a noise component is deducted from a power source through a series transformer, only a clean sinusoidal voltage is impressed to a load.

[0006]

[Example] Next, the example of this invention is explained to a detail using a drawing.

[0007] (Example) As shown in drawing 1, between AC power supply 1 and Load L, as a means to operate a power-source wave orthopedically, the line filter of an example connects the secondary coil of a series transformer TR to a serial so that phase contrast with supply voltage may become 180 degrees, it connects the input side of a filter circuit 2 to AC power supply 1, connects the output side of a filter circuit 2 to the primary coil of a series transformer TR, and changes.

[0008] Drawing 2 - They are the wave of supply voltage E1, and drawing 2 about (a). - If (b) is made into the wave of the output voltage E3 of a filter circuit 2, the load electrical potential difference E4 will be given by the degree type.

$E4 = E1 - E2$  -- the electrical potential difference which removed only the noise component E2 from supply voltage E1 as shown in this formula is a load electrical potential difference. A filter circuit 2 is the circuit which combined a mere reactor, a capacitor, and resistance, or an active filter circuit using an operational amplifier. Even if it is the wave to which not a sine wave but the square wave of an inverter output and a

triangular wave, and others were distorted as AC power supply, it can be made the sine wave by which noise rejection was carried out. The same effectiveness is acquired even if it applies the above example to a single-phase-three-wire-system power source, a three phase power source, and a three-phase-four-wire-system power source. Moreover, the noise rejection effectiveness with the same said of a signal line is acquired.

[0009]

[Effect of the Invention] When this invention which does the above-mentioned operation so puts in a series transformer between AC power supply and a load so that it may become supply voltage and an opposite phase, the capacity of a filter circuit becomes small. Moreover, since the highly efficient active filter used in an electronic circuitry etc. is utilizable also as an object for power, the high performance, the small light weight, efficient, and low cost-ization of a line filter can be performed sharply from now on.

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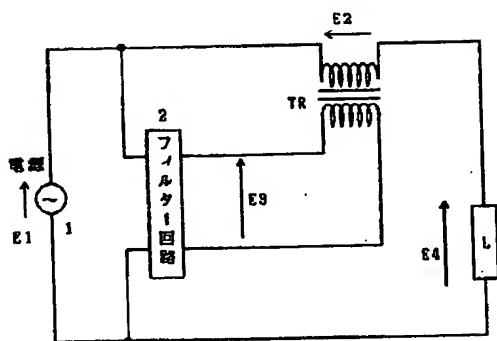
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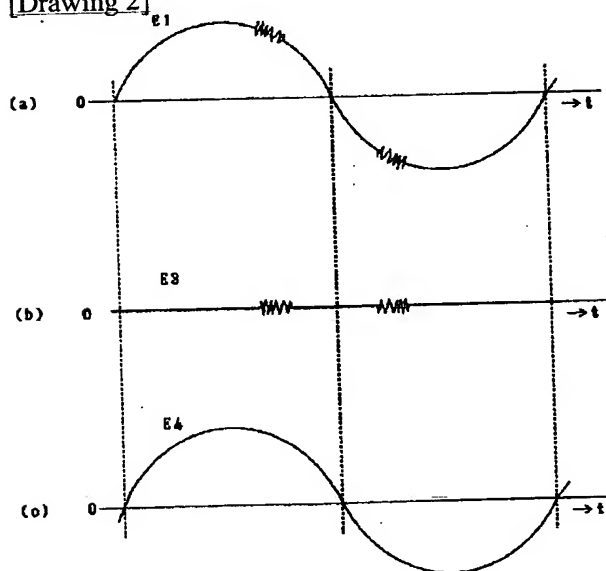
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## DRAWINGS

[Drawing 1]



[Drawing 2]



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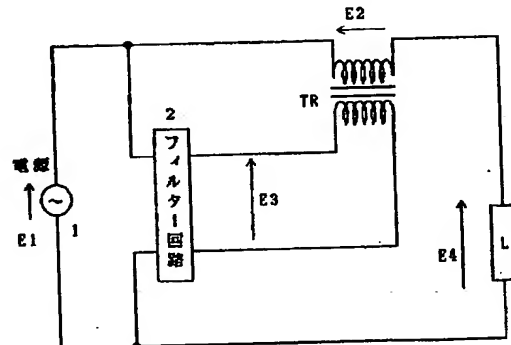
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(54)【発明の名称】 ラインフィルター

(57)【要約】

【目的】 本発明は、交流電源と負荷との間に、電源電圧と逆位相となるように直列変圧器を入れることによって、比較的小容量または高性能のフィルター回路が電力用として活用できるラインフィルターに関する。

【構成】 図1に示すように、交流電源1と負荷Lとの間に、電源波形を整形する手段として直列変圧器TRの2次巻線を電源電圧との位相差が180°となるように直列に接続し、フィルター回路2の入力側を交流電源1に接続し、フィルター回路2の出力側を直列変圧器TRの1次巻線に接続して成る。



## 【特許請求の範囲】

【請求項1】 交流電源と負荷との間に、電源波形を整形する手段として直列変圧器の2次巻線を直列に接続し、

フィルター回路の入力側を前記交流電源に接続し、前記フィルター回路の出力側を前記直列変圧器の1次巻線に接続して、成ることを特徴とするラインフィルター

## 【発明の詳細な説明】

## 【0001】

【産業上の利用分野】本発明は、デジタル機器の増大により昨今問題となっている電源高調波及び電源ラインや信号ラインなどから侵入する電磁ノイズを除去するためのラインフィルターまたはインバータ出力などの波形整形用のラインフィルターに関する。

## 【0002】

【従来の技術】従来のラインフィルターは主にリアクトル、コンデンサ、抵抗を組み合わせたものがほとんどである。

## 【0003】

【発明が解決しようとする課題】しかしながら、従来のラインフィルターにおいては、大電力になるほど電源高調波や電磁ノイズの除去及びインバータ出力などの波形整形が非常に困難になっている。そこで本発明の目的は、以上のような問題を解消して、電源高調波及び電源ラインや信号ラインなどから侵入する電磁ノイズの除去及びインバータ出力などの波形整形を比較的簡単な方式で行うとともに、従来のラインフィルターの寸法、重量、変換効率、信頼性、製造コスト等を改良し、より多方面に経済的效果をもたらすことを目的とする。

## 【0004】

【課題を解決するための手段】本発明のラインフィルターは、交流電源と負荷との間に、電源波形を整形する手段として直列変圧器の2次巻線を電源と逆極性に直列に接続し、フィルター回路の入力側を前記交流電源に接続し、前記フィルター回路の出力側を前記直列変圧器の1次巻線に接続して成るものである。

## 【0005】

【作用】上記構成より成る本発明のラインフィルターは、交流電源と負荷との間に、電源電圧と逆位相となるように直列変圧器を入れることによつて、電源電圧のフィルター回路を通り抜けた電源高調波や電磁ノイズ成分が直列変圧器を通して電源から差し引かれるので負荷に

はクリーンな正弦波電圧のみが印加される。

## 【0006】

【実施例】次に本発明の実施例について、図面を用いて詳細に説明する。

【0007】（実施例）実施例のラインフィルターは、図1に示すように、交流電源1と負荷Lとの間に、電源波形を整形する手段として直列変圧器TRの2次巻線を電源電圧との位相差が180°となるように直列に接続し、フィルター回路2の入力側を交流電源1に接続し、フィルター回路2の出力側を直列変圧器TRの1次巻線に接続して成るものである。

【0008】図2-(a)を電源電圧E1の波形、図2-(b)をフィルター回路2の出力電圧E3の波形とすると負荷電圧E4は次式で与えられる。

$$E4 = E1 - E2$$

この式からわかるように電源電圧E1からノイズ成分E2のみを除去した電圧が負荷電圧となっている。フィルター回路2は単なるリアクトル、コンデンサ、抵抗を組み合わせた回路または演算増幅器を使ったアクティブフィルター回路などである。交流電源としては、正弦波でなくインバータ出力の方形波や三角波、その他の歪んだ波形であってもノイズ除去された正弦波にすることができ、以上の実施例は単相三線式電源、三相電源、三相四線式電源に当てはめても同様の効果が得られる。また信号ラインでも同様のノイズ除去効果が得られる。

## 【0009】

【発明の効果】上記作用を奏する本発明は交流電源と負荷との間に、電源電圧と逆位相となるように直列変圧器を入れることによって、フィルター回路の容量は小さくなる。また電子回路などで使用される高性能なアクティブフィルターを電力用としても活用することができるので今後、ラインフィルターの高性能・小型軽量・高効率・低コスト化を大幅に行うことができる。

## 【図面の簡単な説明】

【図1】本発明の実施例の全体を示す電気回路ブロック図である。

【図2】本発明の実施例の電圧波形を表す図である。

## 【符号の説明】

1は交流電源

2はフィルター回路

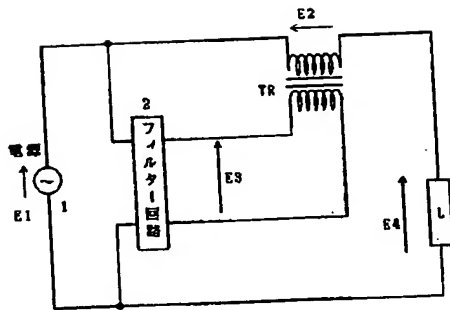
TRは直列変圧器

Lは負荷

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【図1】



【図2】

